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PROCESSING AND EVALUATING BIG DATA AND BUSINESS ANALYTICS IN TOURISM:

An analysis of hotels in Thessaloniki and the region of Halkidiki

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I hereby declare that the work submitted is mine and that where I have made use of another's work, I have attributed the source(s) according to the Regulations set in the Student's Handbook.

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Abstract

This dissertation was written as part of the MSc in Hospitality and Tourism Management at the International Hellenic University.

The development of new alternative forms of tourism, the attraction of tourists from new "emerging" tourist markets, the targeted advertising of Greece and the upgrading of tourist infrastructure are opportunities for the country's hospitality industry (Karageorgos, 2018)[1]. Opportunities that require an important amount of big data and business analytics to be exploited.

This is the aim of this dissertation paper, which is featuring both primary and secondary research of four and five star hotels having more than one hundred rooms in the city of Thessaloniki and the region of Halkidiki in Northern Greece. The reasons behind the selection of these particular regions for research are the position of the International Hellenic University (in Thessaloniki) and the evolving nature of tourism in the area. The results of the research are being evaluated and interpreted with their depiction in graphs and tables for an easier understanding. Furthermore, a discussion about the value of these results to the hotel sector in these areas commences, accompanied with a projection and recommendations into future time periods.

At this point, I would like to first thank my family for their continuous support and encouragement in all stages of my personal and academic life, my fellow colleagues and staff in the International Hellenic University for our essential and intriguing exchange of ideas during my studies, all of the hospitality professionals, who participated in my survey as well as my supervisor, Dr. Korina Katsaliaki, for her invaluable assistance and guidance, from the selection of the topic until the deliverance of this dissertation paper.

Keywords: Big Data analysis, Business Analytics, G.D.P.R., Artificial Intelligence

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[1] Karageorgos, L., 2018. *naftemporiki.gr.* [Online]
Available at: https://www.naftemporiki.gr/finance/story/1322801/sunexizetai-to-anodiko-seri-gia-tin-ksenodoxeiaki-agora
[Accessed 14 January 2019].

LIST OF CONTENTS

List of Figures

List of Tables

CHAPTER 1: Introduction

A company's core competencies are what is left when all of a business' functions are removed. These things are the things the company is especially good at and that can secure its survival in the future, provided it is capable of developing these so that they continue to meet the requirements in the marketplace. Core competencies have little to do with the physical world. They lie in knowing how to handle internal processes and knowing what customers want now and in the future. In other words, the key is to have the right knowledge in the company.

More specifically, what the company needs is for the right people to have the right data and information at the right time. When that happens, there exists a rational decision making that meets strategic, operational and market conditions. That, in addition, requires also a provision of data to drive digitized processes in an intelligent way and it is known as Business Analytics (Laursen & Thorlund, 2017)[2].

This is a research based on real and recent data received in the form of a questionnaire from employees of four and five star hotels, the majority of whom are placed in managerial positions. It presents great significance, since it was implemented after the voting of the General Data Protection Regulation on May 2018, is representative of Greek hotels in the aforementioned areas and focuses on the actual reasons behind data processing and evaluation. It aims to uncover how familiar the hoteliers are with the process of Big Data analysis, what problems the lack of specialists and analysis software cause and exhibit a wholesome picture of their incentives, apprehension and ambitions both now and in the future.

The main questions of the research are connected to correlations between the effort Big Data needs to extracted in a specific time period, how this timeframe is intertwined with the (lack of) employment of experts in Big Data analysis in those hotels, from which department the majority of this data is being produced and by whom it is evaluated. Secondary questions include the role of Property Management Systems and hotel databases, the adoption level of Artificial Intelligence in the future by

[2] Laursen, G. H. & Thorlund, J., 2017. *Business Analytics for Managers: Taking Business Intelligence Beyond Reporting,* Hoboken: s.n.

hoteliers and the reasons behind their decisions to share, analyze and make use of guests' information.

The thesis is constructed in a manner that firstly introduces the subject of Big Data in the Hospitality sector with an overview of Greek hotels and tourism figures and characteristics. This acts as a way to comprehend the special conditions that formulate a highly antagonistic and evolving environment, where hotels are encouraged to improve daily their services. Afterwards, a brief presentation of existing literature and research ensues with mentions to the technological evolution that renders Big Data (and Business Analytics) a major "game changer" in hotel businesses.

This is followed by an extensive listing of data concerning characteristics of the touristic areas of Halkidiki and Thessaloniki, including recent developments in infrastructure and tourism flows. The research methodology and survey conducted in hotels in these areas exhibits the data that support and contrast current hospitality trends. In the end, conclusions deriving from the results of the research lead to future suggestions, which establish the basis for extensive research in the years to follow.

CHAPTER 2: Literature and existing research

Guest personalization and value-driven service are among the top priorities among hotels to drive up occupancy, as well as to keep their guests coming back. Technology is also playing an increasingly important role in giving travelers a better experience, reveals the 2018 Guest Experience Assessment Report. Jointly released by StayNTouch, Travel Tripper and TrustYou the study surveyed more than 300 hoteliers worldwide. It examined guest experience trends and their adoption in the hotel industry, as well the areas in which some hotels may be falling behind.

Some key findings:

- 74.7% of respondents say that they respond and resolve standard guest requests either quickly or very quickly
- 68.4% of respondents recognize the need to improve their use of mobile technology to improve the guest experience.

- 48% of respondents acknowledge they are finding it challenging to capture or utilize guest data to personalize the guest experience.

An interesting fact is emails and phones are still the primary means of communications among many of the hotels – an area for improvement as in-person interactions establish more personalized rapport with guests, stated the report (WiT, 2018)[3].

Hotel guests often anticipate that their particular needs and expectations will be attended to, which requires that this information is maintained and updated in internal or external databases. Travelers expect to receive rewards based on their current status in affinity programs, necessitating regular updates to additional up-to-the-minute databases. Online travel agents like Expedia, Booking.com, Travelocity, Kayak and others appeal to customers by offering attractive discounts they secure by reserving rooms in block quantities. These booking aggregators typically provide hotels with minimal information such as name, room type and dates of stay—but not e-mail addresses, which they avoid sharing in order to enlarge their own private marketing databases (Cella & DeMayo, 2018)[4].

The survey of more than 1,050 properties, conducted by the Hotel Analytics Work Group of the Hotel Electronic Distribution Network Association and recapped in February by Phocuswire, compiled responses from chain and independent hotels and management companies. HEDNA co-authored a report with SnapShot and Triometric. Much of the study focuses on hotels' relationship with online travel agencies. The numbers from the report paint a picture of heavy reliance — perhaps over-reliance — on OTAs for securing bookings. Hotelier respondents also gave HEDNA a sense of how much these different channels shared data and analytics to help hotels make pricing and distribution decisions. It would appear that many third-party distributors take more than they give when it comes to data:

[3] WiT, 2018. *WiT.* [Online]
Available at: https://www.webintravel.com/how-does-your-hotel-stack-up-in-guest-experience-find-out-in-this-new-report/
[Accessed 13 January 2019].

[4] Cella, C. & DeMayo, T., 2018. *HOTEL MANAGEMENT.* [Online]
Available at: https://www.hotelmanagement.net/tech/gdpr-inhospitable-to-hospitality
[Accessed 13 January 2019].

- Wholesalers, metasearch engines, and late-booking or last-minute channels were most likely to give no access to any data.
- OTAs were characterized in the study as providing the best data. Three in 10 properties reported getting real-time information or daily analytics from OTAs.
- Overall, respondents identified data quality and data "cleanliness" as the biggest challenge in getting information from online distribution partners.
- One in 10 respondents said both internal integrations and staff training were concerns. In addition, 15% of properties cited integration among source systems and external systems as a key concern (Brandau, 2018)[5].

The amount of data out there that can shape and improve a hotel's Revenue Strategy continues to grow, but there are a few main buckets to focus on: historical data, demand signals (forecasting), transactional data and guest preferences. However, once the transaction is over, the guest becomes the hotel's, all the way from pre-stay through post-stay, follow-up. This allows hotels to learn more than anyone about their guests — preference data — and then serve up relevant content and offers and generally make a more pleasant booking experience.

Hotels own their PMS and CRM data. Third parties do not have the real-time access to data hoteliers store in their own systems, and without these critical connections OTAs can't analyze inventory and guest preferences to make the best pricing, promotion and operational decisions. Integrating with travel data companies gives hotels access to demographic information, travel interests, family make-up, etc. — for known and unknown guests — helping hotels better understand what guests are doing even when they're not booking with them.

One major hurdle is that fragmented and closed systems have, until recently, been a major roadblock in making much of this data actionable. Even today, much of this information is being captured in fragmented silos. Integrating systems that are written to the same specs and send the same types of files is costly and labor-intensive.

[5] Brandau, M., 2018. [Online]
Available at: https://www.duettocloud.com/library/data-resets-hotel-ota-relationship-better-terms
[Accessed 13 January 2019].

There is data stored in a warehouse or a CRM somewhere but really making the data actionable in real time is tough.

Cloud platforms allow this data to be stored off-premise in an easily accessible place. When data is collected and stored in a single, centralized place, it can then be analyzed and served up to the right application in milliseconds. But not without the proper integrations. The data can be segmented to determine who a hotel's most valuable guests are, what their preferences are and why they travel (Q. Freed, 2018)[6].

Managing a hotel's online reservations without a PMS, booking engine and channel manager could actually cost more in the time wasted in processing bookings, and lost opportunities in capturing new guests. A PMS system could give hoteliers all the tools they need to be totally organized in running their property. An all-in-one PMS system could give hotels one place to find all the information they need, and it could take them much less time to complete the same tasks (Anon., n.d.)[7].

General Managers need to be able to integrate with mission critical systems like business intelligence or staff task management. Hoteliers want to be able to access their PMS on any device as their businesses are constantly running 24/7. The total number of customers has a high correlation with revenue and companies with more revenue (all else being equal) have a higher probability of longevity and more profit to invest in R&D, product development and customer support.

Regarding hotel technology, things like 24/7 support or a 32 percent ROI are quantitative metrics that help hoteliers determine which software to select. "Ease of use" is critical because it is not desired for software development companies to be constantly bringing in new trainers for every incremental employee. Hoteliers have some of the most stressful jobs in the world and easy-to-use products are critical to ensure that they are happier and more effective at work.

[6] Q. Freed, J., 2018. [Online]
Available at: https://www.duettocloud.com/library/hotel-ecommerce-data-analytics
[Accessed 13 January 2019].

[7] Anon., n.d. *LittleHotelier.* [Online]
Available at: https://www.littlehotelier.com/how-to-choose-an-all-in-one-pms-system-for-small-hotels/
[Accessed 13 January 2019].

There are generally three main issues that prohibit General Managers from adopting new technology: 1) education, 2) authority and 3) risk aversion. General Managers are usually not tech people so they do not always have the confidence to make technological buying decisions. Although there are tons of articles, podcasts and press releases across the web that could help, the reality is that most General Managers do not have time to sift through the sea of content.

Authority is another problem. Tech suppliers could be pitching a hotel in December but the hotel may have already budgeted for the year and, in many cases, the General Manager simply does not have authority to break any previous commitments. Furthermore, their organizational structure often makes it hard to find the real capex decision makers. The third problem is risk aversion. A General Manager is unlikely to win a promotion for signing on a new technology vendor and, if that vendor is a poor fit, there is also the chance that their career could suffer (Mews Systems, 2018)[8].

One of the most common reasons for poor RevPAR originates from making initial assumptions about guests. Every hotel is unique and special; there is not another single property like it. This means that guests have certain niche desires and tastes. However, these vary from person to person. What hoteliers should want is to start by creating buyer personas. These are fictional representations of real guests that help marketers target precise segmented groups with the right messaging. A buyer persona typically covers one's age, gender, income level, occupation, job title, family status, hobbies and a number of other intimate details. In order to create buyer personas, data is required. This type of data can be uncovered from the sales department, combing through emails from past guests (as well as those who cancelled a reservation or never booked) and through social listening tactics.

Another common reason hotel properties suffer from poor RevPAR is their lack of data necessary for targeting groups of people likely to convert to bookings. The right data is necessary for determining why people book, i.e. what channel they came from (so that hoteliers know where to continue investing), what content they read, and the

[8] Mews Systems, 2018. *MEWS.* [Online]
Available at: https://www.mewssystems.com/blog/an-insiders-guide-to-pick-the-best-hotel-management-software/
[Accessed 13 January 2019].

steps they took in the buyer's journey before finally making a reservation. Collecting data is also valuable because it reveals where leads dropped off and can shed insight into why someone fails to book a room.

The best hotel marketing agencies use CRMs that have powerful data tools. For example, HubSpot gives marketers advanced intel on leads such as their names, email address, where they work, job titles and more. It reveals how these people found the hotel property's content, how long they spent reading the article, which pages they went to on the website and where they dropped off or converted into a booked room. This is data that goes well beyond Google analytics and offers a plethora of value in giving marketers the information they need to optimize marketing strategies designed to improve a hotel's RevPAR. Hotel marketing agencies, which master inbound strategies, are able to collect the needed data with an advanced CRM, and automate customized emails thus saving their clients time and money (Gasko, 2018)[9].

Any breach of data security is serious and can have severe consequences in terms of loss of revenue, but also for the business's reputation and customer loyalty. It goes without saying that no guest wants to risk staying at a hotel if they are not confident that their personal information is safe. As a result, it is more important than ever to reassure customers that there are solid security measures in place to protect their information through online booking tools and when using credit cards within the actual hotel (Murphy, 2016)[10].

All companies and organizations that operate in the EU or that provide or plan to offer goods or services to constituencies in the European Union are required to comply fully with GDPR, which went into effect on May 25, 2018. The regulation applies to all travel agencies, tour operators, hotels, motels, inns, clubs, bed-and-breakfasts, Airbnbs, automobile rental agencies, restaurants, aggregators and other travel and hospitality groups that operate in Europe—or to groups that operate outside

[9] Gasko, E., 2018. *WEBITMD.* [Online]
Available at: https://webitmd.com/blog/industry-news/top-3-hotel-marketing-mistakes-kill-revpar/
[Accessed 13 January 2019]. https://www.smartdatacollective.com/envisioning-tourist-demand-big-data/
[Accessed 22 April 2018].

[10] Murphy, H., 2016. *frontdeskAnywhere.* [Online]
Available at: http://blog.frontdeskanywhere.com/4-ways-to-protect-guest-information
[Accessed 13 January 2019].

of the EU and actively maintain information on and market their services to EU residents.

Under GDPR, a hotel will be held accountable should a breach occur at a firm to which it has outsourced data processing. The reason is that the regulation identifies organizations by category—data controllers or data processors. An entity can be one or the other—but it can also be both, thus upping the ante for noncompliance. Simply stated, controllers control; they determine why and how consumers' personally identifiable information is used. Although they don't necessarily store or process data, they are still fully responsible for how data is maintained, employed and deleted even when handled by a third party.

Similarly, processors process; they store data, often but not always on a third-party server—and then manage, sell or otherwise manipulate that data for the controller or for themselves. Examples include: external payroll processors; market research firms; affinity programs that sell to member bases such as hotel rewards programs; and aggregators that market their own and others' products and services to the consumer. This layered complexity adds layers of responsibilities that must be met. Management should be educated about GDPR's requirements and implications. Staff should also trained to handle data—and customers—properly. Websites, privacy policies and communications materials should be reviewed and revised as well as third-party resources that should be vetted, software customized, contracts, procedures and processes analyzed and updated. Breaches are expected to be reported to both authorities and those affected within 72 hours. Combined, these tasks and others, create an onerous burden, which is why many organizations rely on experienced specialists for guidance and support (Cella & DeMayo, 2018)[11].

CHAPTER 3: An overview of the research areas

The Prefecture of Halkidiki is located in the southeastern portion of Central Macedonia, Greece and consists of a large peninsula in the northwestern Aegean Sea resembling a hand with three "fingers" – Kassandra, Sithonia, and Agion Oros, which

[11] Cella, C. & DeMayo, T., 2018. *HOTEL MANAGEMENT.* [Online]
Available at: https://www.hotelmanagement.net/tech/gdpr-inhospitable-to-hospitality
[Accessed 13 January 2019].

contains Mount Athos and its monasteries. Kassandra has popular tourist resorts with organized beaches. The second peninsula, Sithonia, features less organized resorts and more secluded coves. The third peninsula, Mount Athos, is a secluded monastic community where entrance is allowed only to men and after special permission and has been listed as a World Heritage Site since 1988.

The prefecture occupies 2,918 km² of land and features approximately 105,000 permanent inhabitants. Halkidiki shows significant activity in the agricultural sector. A significant contribution to the local economy is also managed wood logging, forest fruits, game preys and aromatic herbs. Halkidiki is one of the top producers in olive and citrus production in the country, while its subsoil is rich in colored metals and minerals. Also various types of wine are produced with the most notable being protected under the quality assurance labels DOC/DOP. Gold was mined in the region of Halkidiki during antiquity by Philip II of Macedonia and the next rulers. Critics, however, claim that mining would adversely affect tourism and the environment.

One of the most impressive caves in Europe is found in Halkidiki. The Cave of Petrálona is located at 300 meters above sea-level, about 35 kilometers southeast of the city of Thessaloniki. People can also visit the nearby museum, where a large number of fossilized bones of different mammals are on display. Ancient Olynthus is a well-preserved Greek city aging back to the Classical Period located in a fertile plain at the head of the Gulf of Torone. Stageira is lying on a picturesque plateau on the peninsula, standing at the foot of the Argirolofos hill. It is the homeland of Aristotle, who was born here in 384 B.C. The archaeological site includes an acropolis, fortifications, an ancient temple and Classical and Hellenistic homes.

During summer, a lot of remarkable artistic festivals take place in many parts of Halkidiki. Music provides the main focus but the performing arts are also prominent and every summer the region's open-air theatres play host to some major presentations. In addition, many areas within the region are characterized as "Natura 2000", which is the centerpiece of EU nature and biodiversity policy. Halkidiki features 12 protected areas of Natural Beauty and Biodiversity by the Natura European Network within its boundaries. The entire region boasts numerous kilometers of coastline and plenty of beaches while 54 of them are awarded with the "Blue Flag". Furthermore, the region hosts two of the largest marinas in Northern Greece that are parts of bigger integrated

hotel resorts (namely the Porto Carras Grand Resort and the Sani Resort) and are also awarded with the "Blue Flag".

Halkidiki has been a popular summer tourist destination since the late 1950s when people from Thessaloniki started spending their summer holidays in the coastal villages. With over 300 days of sunshine throughout the year and 54 EU Blue Flag awards for the clean waters of its beaches - more than any other Greek region – it is obviously a popular choice for a holiday destination. At the beginning, tourists rented rooms in the houses of locals. By the 1960s, international tourists, especially from Austria and Germany started to visit Halkidiki more frequently. Since the start of the big tourist boom in the 1970s, the whole region has been captured by European tourists but also those originating from countries close to the northern borders of Greece that access the region by automobiles. Halkidiki is also a popular destination amongst Christian Orthodox populations (e.g. Serbians, Ukrainians, Russians, etc.) because of its proximity to the monastic community of Agion Oros and its monasteries that are considered to be some of the most significant places for the religion.

Tourist development started in Halkidiki in the 1960s when the first tourist installations were established by the National Tourist Organisation (EOT): the Xenia hotels in Paliouri (Kassandra) and in Ouranoupolis, near the border of Mountain Athos. However, the big boom took place during the period 1968-75, when big tourist complexes were built in Kassandra and Sithonia and the beauty of Halkidiki was introduced to the tourist markets of Europe and America. Since then, tourism has continually increased and nowadays is the main source of income for most of the locals while its contribution to GDP of Halkidiki is vital.

An average of about 80% of the total accommodated bednights in hotels in Halkidiki has been of international nature. Domestic tourists that live in the northern parts of the country also find the region easily accessible by car whereas scheduled and/or charter flights are serviced from Thessaloniki International Airport during the summer period. During the period 2005-15 the number of total bednights has experienced vigorous growth of 78.2% driven by the momentous growth of international tourism by 99.0% while domestic tourism slightly decreased. The overseas tourist segment has shown a steadily increasing pattern over the last ten years, as it doubled its size while 2015 was the first year that international arrivals recorded a

minor drop. Domestic tourism has also recorded significant increase until 2009 while from 2010 onwards the figure kept diminishing as domestic population's available income shrunk due to the national economic crisis.

Throughout the examined period, Halkidiki has been demonstrating the same seasonality pattern with very high numbers of arrivals from May to September, when approximately 75% of the total visitors arrive, and very low numbers of tourist arrivals between October and April. This pattern is mainly attributed to the fact that until now the country has been lacking the basic tourist related infrastructure to attract winter and off-peak tourism such as golf courses, high level spas, large size conference centers, and organized holiday home establishments. The lack of a strategic plan towards that direction has not let Greek destinations to reveal their full potential in attracting tourism all year round in areas like Halkidiki, Peloponnese or Crete that combine all necessary basic characteristics and infrastructure in order to accept tourism even in winter months.

The majority of hotel units are of one-and two-star classification; however, five- and four-star hotel units together constitute the ones with a significantly considerable number of available rooms and beds. Development of five-star units has witnessed significant growth since 2009 and especially during the period 2014-16 when approximately 1,500 new hotel rooms entered the market. In general, five-star hotel rooms and beds in Halkidiki have almost doubled in number during the period of 2009-15 revealing the intensive investment interest in the region by hoteliers and investors. Average room number of a five-star hotel in 2016 is 195 while average bed number is 412. Both numbers are higher than the average hotel size in 2009 (165 and 350, respectively). Throughout this period the presence of four-star properties in Halkidiki contracted by more than 800 rooms.

The most notable hotel chains in the region are the G Hotels and the P.A.P. Corp. Hotels. The former operates six units of various classifications in Greece, five of which are located in Halkidiki and one in Crete, and its total hotel room count is 1,609. The latter operates three upscale hotels in Halkidiki and a three-star hotel in the city of Thessaloniki with all four properties totaling 1,084 rooms. Other Greek hotel groups, with presence in Halkidiki are: Macedonian Hotels (TOR Hotel Group), Aegean Star as well as Grecotel Hotels & Resorts. The Sani Resort is an integrated resort similar to Porto Carras Grand Resort. Nonetheless, the region lacks a significant number of

international hotel brands, which could boost its upscale profile and recognition, thus leading to even higher levels of sales efficiency and operating performance (Boussia & Papadimitriou, 2017)[12].

While the city of Thessaloniki exhibits a smoother transition from winter to summer as it is an all-year destination with low but stable visitation mainly of domestic nature, Halkidiki's seasonal activity contribute to the sharp increase of bednights during summer months and to the steep downfall during winter season. One of the biggest issues Greek tourism industry, Halkidiki included, is facing is the seasonal nature of its visitation. Amongst others, the three main limiting factors that impede a change in this pattern are the lack of direct flights from major source countries during the winter months, which greatly limits access, the lack of appropriate infrastructure throughout the region capable of attracting visitors during shoulder months and the weak positioning of Greece in various niche markets (city-break, sea tourism, health tourism, etc.) in comparison with other competitive countries. According to various sector studies, the size of these tourism market segments is undoubtedly significant both in terms of number of trips and expenditure, since they encompass sophisticated travelers seeking for differentiated experiences.

The number of overnight stays at hotels in Thessaloniki edged up in the first eight months of 2018 compared to the same period last year. According to the Thessaloniki Hotels' Association (THA) report carried out by GBR Consulting, the number of Greek visitors to the northern port city increased slightly by 0.70 percent to 725,972 overnight stays against 720,951 in the same period in 2017, accounting for a smaller share of total overnight stays compared to foreign travelers.

In terms of source markets, the THA report ranked Israeli visitors at the top (from 3rd spot among 20) in terms of overnight stays to 111,008 from 56,167 in the same eight-month period last year, marking a 97.64 percent rise. Cypriot travelers follow with 94,366 stays recording a 1.83 percent drop, with German tourists in the third spot, making 57,965 overnight stays – a 4.21 percent increase. Holidaymakers from Italy, the UK and Holland marked impressive increases in the eight-month period

[12] Boussia, N. & Papadimitriou, P., 2017. *HVS.* [Online]
Available at: https://www.hvs.com/article/7961-in-focus-halkidiki-greece
[Accessed 13 January 2019].

by 25.31 percent or 51,859 overnight stays, 15.85 percent to 34,124, and 18.99 percent to 16,007, respectively.

Meanwhile, GBR's monthly findings indicate that for the first eight months of 2018, there was a 6.2 percent increase in average room rate (ARR) and an 8.7 percent rise in revenue per available room (RevPar) to 51.38 euros compared to a year ago. Despite the slight improved performance in 2018, Thessaloniki is still ranked last among 10 European cities of the same size (Antwerp, Birmingham, Cologne, Düsseldorf, Edinburgh, Glasgow, Budapest, Hamburg, Manchester, Salzburg) with regard to RevPar and ARR (GTP editing team, 2018)[13].

Halkidiki is easily accessible with every means of transport. The significance of road arrivals for Greek tourism is extremely important since one in every three visitors enters the country by car. In fact, out of the 25.1 million international arrivals in 2016, approximately 8.5 million tourists arrived by car. A significant amount of domestic tourists traditionally reach Halkidiki by car and at the same time Halkidiki is located at a close driving distance to all major Balkan cities, which are major source markets of incoming tourism. It is envisaged that the short-term future waterways will be added on to the country's ports in order to support seaplanes. That could be instrumental towards the extension of the tourism season and will promote new destinations while distributing the gains to local island communities and markets.

Primary air transportation to all areas of Halkidiki is provided through Thessaloniki (or "Makedonia") International Airport that is the third largest airport in the country. Its presence is crucial for the unceasing development of tourism in the wider area. It opened in 1930 and is the second busiest airport in Greece in terms of flights served and the third busiest in terms of passengers movements served in 2016, with over five million passengers. It is the main airport of Northern Greece and serves the city of Thessaloniki, Halkidiki and the surrounding cities of the region of Central Macedonia. There are several airlines flying to Thessaloniki International Airport connecting other Greek or European cities to Thessaloniki. However, most of these flights operate on a seasonal basis, which inhibits the annual operation of tourism-related business. Air travelers can fly into Thessaloniki and get transportation from

[13] GTP editing team, 2018. *gtp headlines.* [Online]
Available at: https://news.gtp.gr/2018/10/03/thessaloniki-overnight-stays-edge-up-jan-aug-2018/
[Accessed 13 January 2019].

there to Halkidiki with most touristic places being within 60 and 120 minutes driving time from the airport.

Plans envisage that by 2020, Thessaloniki will have one of the best airports in Southern Europe, with passenger traffic expected to increase by 48% by 2026 with the airport being double in size, with the space of the terminal station rising from 25,000 m^2 to 57,000 m^2. The project will also include a reorganization of parking slots, with the creation of power-in/push-back positions, new tarmac, a new fire station, all based on international standards. Additionally, the new airport management expressed its intention to cooperate with professionals and enterprises in Thessaloniki to ensure a steady and solid development of the region (Boussia & Papadimitriou, 2017)[14].

CHAPTER 4: Conducting the survey

This research is characterized as qualitative because it relies on numerical evidence in order to draw conclusions. The research type itself is that of a survey, used to uncover the characteristics of a certain "population", in the form of a detailed five minute online questionnaire. The reasons behind the selection of this particular type of research is because the central desire is to seek out ways to measure the knowledge, opinions, behaviors, beliefs and attitudes in a real life theatre of hotel operations when it comes to Big Data.

Such a kind of research is crucial to acquiring missing data regarding Big Data in the Hospitality industry. This lack of information is exceedingly evident in Greece in general and in the areas of Thessaloniki and Halkidiki in particular. The questionnaire was also addressed to four and five star hotels with more than 100 rooms and it placed great focus on the way this data is utilized by hotels as well as under which conditions it is evaluated in key daily practices. With the focus placed solely on the data collection methods, so far there has been no academic papers that have investigated this matter including all the aforementioned special characteristics as to become a benchmark or basis for further elaboration.

[14] Boussia, N. & Papadimitriou, P., 2017. *HVS.* [Online]
Available at: https://www.hvs.com/article/7961-in-focus-halkidiki-greece
[Accessed 13 January 2019].

The online questionnaire was constructed in a way to "introduce" participants into the subject of Big Data without being too intrusive and a format following a chronological order including peripheral issues like G.D.P.R. and A.I. integration in hotel P.M.S. systems. The total number of questions was thirty one and it included multiple choice, Likert scale type questions, short and long answers and checkboxes selection. The response rate was formulated at a 4.8%.

The link to the questionnaire was distributed via e-mail messages and personal messages on the business social media platform LinkedIn to thirty four hotels addressed only to employees with managerial and executive positions in them. The participants in the survey were people, who possessed deep knowledge of many hotel operations, P.M.S systems and Big Data practices. Therefore, the goals of the research are to comprehend in what manner Big Data is exploited in modern hotels in northern prefectures of Greece and provide the industry with accurate, real life information on how these hotels perform compared to global benchmarks through the extraction of all essential data to reach a conclusion with suggestions for future research works.

Out of those hotels, seven hotels responded while the rest did not for a variety of reasons. The duration of the survey was a time period of fifty days (from the 3rd of November until the 22nd of December 2018), during which several conventions and exhibitions revolving around the Hospitality industry took place in the country and abroad. The majority of the hoteliers did not offer any reason for their dismissal of invitation to participate in the survey, probably due to the fact that their hotel operations were minimized (or seized with the end of the summer season) or personal unwillingness to provide information. Some professionals responded by saying that they had no time to answer because they were on consequential business trips to conventions, others did not have knowledge of the subject or could not respond on behalf of the whole hotel or hotel group and few refused to share information on the grounds of confidentiality and G.D.P.R. restrictions implemented at their workplace.

1. What is your full name?
2. What is your position in the hotel?
3. On what sort of data do you mostly focus?
4. What is the preferred method of Big Data collection in your hotel?

5. Which Property Management System are you using in your hotel?
6. What type of P.M.S. is it?
7. Which of the two (2) primary criteria does this P.M.S. fulfill?
8. Has the European Union's General Data Protection Regulation (G.D.P.R.) altered your previously implemented data collection practices?
9. During the examination of Big Data, do you focus on particular groups of guests based on specific personal characteristics (i.e. country of origin, family/ party members, profession or interests etc.)?
10. Do you use information from Social Media platforms to complete a guest's profile or "persona"?
11. Do guests' reservation characteristics (e.g. last-minute or direct reservations) affect the scope, procedure or set objectives of the hotel management?
12. Do you integrate all guests' information from the P.M.S. into your hotel's marketing strategy?
13. What is the main contribution of Big Data to your hotel?
14. Which of the following two (2) goals does the daily use of your P.M.S. achieve?
15. Do you share Big Data with your hotel's partners (e.g. Tour Operators, partner taxi/ shuttle company etc.)?
16. Do you encourage your guests' active participation in creating new content (e.g. online reviews, posts on Social Media) to further promote your hotel?
17. Does your hotel's Big Data have a use in B2B meetings or other business ventures (e.g. expansion plans, change in employees' remuneration schemes, renovation or "takeover" efforts etc.)?
18. Do you use guests' data to acquire long-term benefits (like guest retention)?
19. How often is Big Data being evaluated by the hotel management and staff?
20. Why is this amount of time required in order to evaluate Big Data?
21. Is there a specialist/ group of experts on Big Data employed in your hotel?
22. Who is responsible for the evaluation of your hotel's Big Data?
23. Which department generate the majority of your hotel's Big Data?
24. From which department is the Big Data mostly being exploited?

25. What kind of compensation do your guests receive in exchange for sharing their personal information?
26. How much effort is needed to extract the required data from the general "pool" of data?
27. On a scale of 1 to 5, how effective do you consider your current processing practices of your guests' personal data to be?
28. What type of "gap" do you find in the current data analysis by the P.M.S. systems?
29. Would you opt for a P.M.S. that features Artificial Intelligence (A.I.) characteristics (reputation management, competitive intelligence etc.)?
30. Why is the case so?
31. What features would you suggest to be added to hotel P.M.S. systems to achieve more success in a future marketing strategy?

All thirty one questions as listed here, comprise the total amount of questions used in the questionnaire survey.

The very first question is a personal one for all participants of the survey as an introduction and a way to verify the personal details of each hotel's representative. The names were strictly used by the writer of this research paper in order to ensure that a sole answer from every hotel was given by real employees and to personally thank them for taking time of their schedule to complete this questionnaire. Similar to the first one, the second question requests to explore the participant's exact working position within each hotel.

Afterwards, the main body of (the most relevant to the theme of the survey) questions begins with the desire to understand what sort of data hotels focus on and in which way that is implemented, particularly when it revolves around Big Data. Acknowledging that hotels use for their operations Property Management Systems (P.M.S.) to massively collect Big Data, the following three questions (number five to seven) seek to find what the most common system in use is. To reach more conclusions, it was also asked whether the systems were cloud-based or installed in the hotel terminals and what purpose they serve.

Question number eight is a unique one and indicative of the extent of change the voting of the General Data Protection Regulation (G.D.P.R.) has brought to the whole industry. From this point onwards, until the twenty seventh question, all inquiries are focused on verifying whether hotels with more than one hundred rooms in the area of Thessaloniki and Halkidiki are performing in an akin manner to global hotels. Right from the start, it was asked if guests' data matter in a "filtered" sense based on specific features, used to create a full "picture" of their personality traits, consumption habits and reservation methods even, to the point of being integrated in the hotel's marketing strategy or creating a major impact on the management's decision making attempts.

Additionally, the facilitation of Big Data collection by P.M.S. systems generated questions on how they are utilized to perform according to set goals. There are times when even a hotel's partner firms associated with guests' satisfaction or transportation "crave for" acquiring more information on them to proceed with their (marketing) agendas.

In a world where confidentiality forms or contracts and the G.D.P.R. enforce a strict and discreet environment for hotel operations that handle guests' data, how this information distributed to third parties, used to encourage hotel management's initiatives or the "co-creation" of experiences by guests themselves and the increase in satisfaction urging them to revisit the hotel next year is mentioned in question sixteen.

Since evaluation is incremental to the process of best exploitation of benefits originated by Big Data, the participants were asked to provide this research with the timeframe within which this information is being analyzed, by whom (including whether they are experts) why and as a result of which department's operations. They were also expected to choose between scaled options when it came to the effort needed to evaluate the data followed by a set of questions to further support the reason behind their answers. These questions referred to potential gaps in modern Big Data analysis methods and systems.

The questionnaire concluded with one of the most disruptive technologies in the Hospitality industry in the form of P.M.S. systems with functions, auxiliary Artificial Intelligence (A.I.) mechanisms or capabilities that have diagnosed current positive value and unlimited future assets. It is exactly this ambiguous nature of A.I. that gives birth to different, sometimes contrasting, voices to hoteliers.

The final question allows an open-ended answer to be given regarding personal suggestions to improve hotel P.M.S. systems-based marketing strategies in the future to abolish present mistakes or inaccuracies and support the development of new applications.

CHAPTER 5 – Analyzing the questionnaire

Starting the questionnaire, the profile of the participants should be emphasized as to better comprehend the value of their contribution to the survey. Four out of seven were male hotel employees and hold managerial positions with two of them being General Managers and the rest a Rooms Division and Sales Manager respectively. The female participants were significant members of their hotels in various positions, such as the Human Resources, Reception and Invoice Control and Banquet Sales Departments. The hotels in which they were employed are Sani Resort – Porto Sani Village, Ikos Olivia, Aegean Melathron Thalasso Spa Hotel, The Met Hotel, Miraggio Thermal Spa Resort, Anthemus Sea Beach Hotel & Spa and Holiday Inn Thessaloniki.

2. What is your position in the hotel?
General Manager
HR MANAGER
General Manager
Reception and Invoice Control
Rooms Division Manager
Banquet Sales Executive
Sales Manager

Table 1: Hotel position of survey's participants

Out of the total number of hotel representatives that took the liberty to share information via the questionnaire, four of them are employed in hotels that operate during the summer season. The rest three belong in the staff of all-year round city hotels, which conduct business non-stop all seasons. In terms of employee status, an approximate quarter of them are General Managers with the remaining percentage being equally split in the heads of several departments; these include Human Resources, Banquet Sales, Sales and Reception and Invoice Control departments.

Per hotel management's instructions, emphasis is placed on guests' data as the next graph suggests, especially since they are the driving force that acts as an impetus for development,

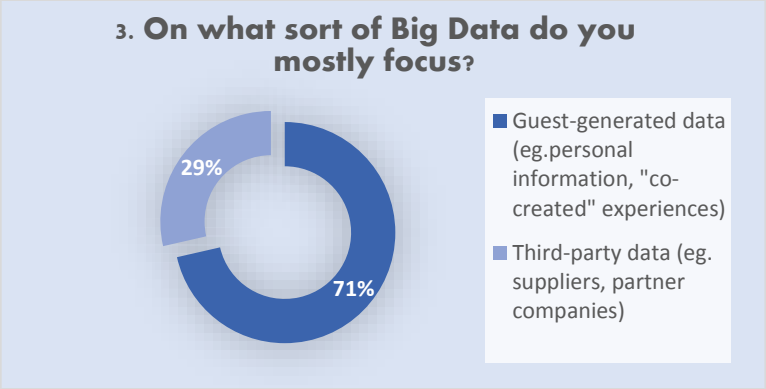

Figure 1: On which Big Data a hotel places its focus

innovation and competitiveness in the Hospitality Industry. Customer Relationship Marketing (CRM) is often the center of attention for such service focused operations, as those conducted in a hotel.

In addition, the majority of hotels tend to follow a standardized and (semi) automatic method of Big Data collection. They make use of P.M.S. systems, which feature the option for guests themselves to enter their personal details before their arrival (like in the case of online reservations through a hotel's corporate website or an Alternative Distribution System – A.D.S – such as Booking.com) or during their check-in, similar to express online check-in stations (or terminals). Naturally, the more traditional approach consists of a manual insertion of this data by an (Front Office) employee.

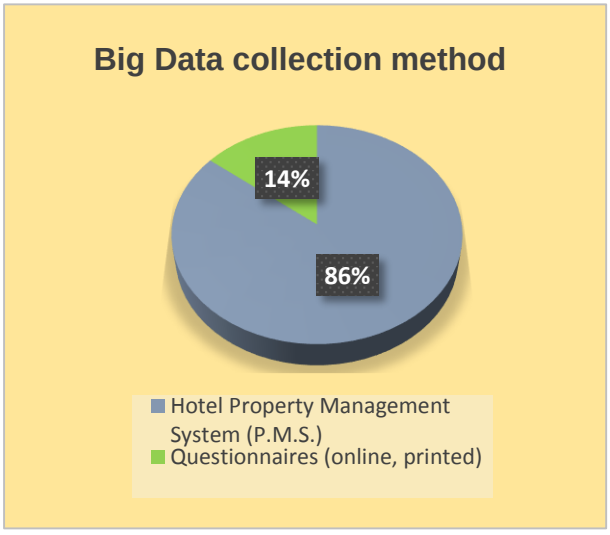

Figure 2: Big Data collection method

The source of information about a hotel's guest derives from their own P.M.S. systems as the staggering 86% in the graph suggests. Still, a minor percentage opts for a different approach in the form of the questionnaire surveys in written or online form.

When asked about the P.M.S. that is in use in the hotel, where the survey participants are working in, they explained that they use at a 43% Protel or Opera P.M.S. systems, with just a 14%

preferring to use ESP. There is little to no difference between the types of software the P.M.S. is: cloud-based (43%) or not (57%).

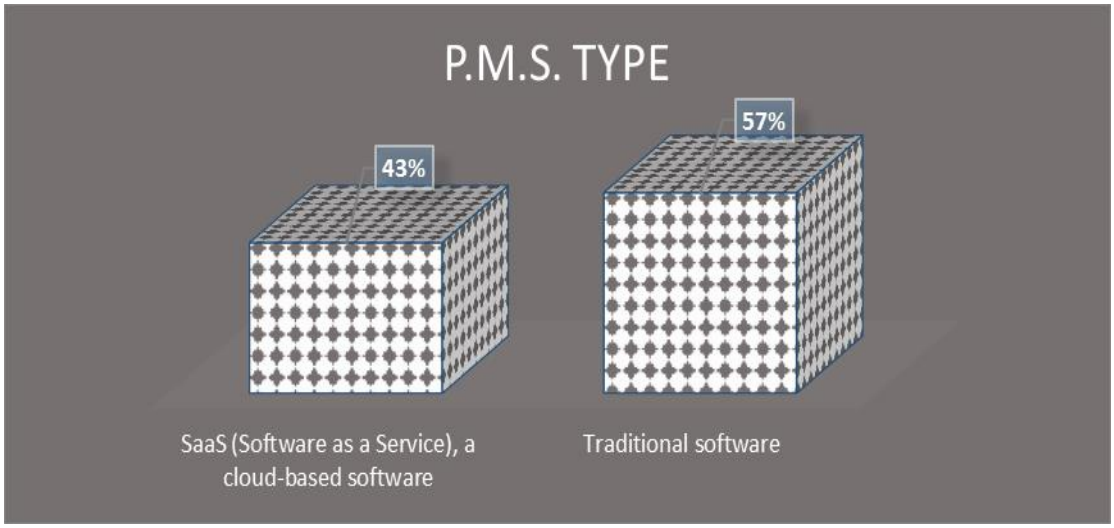

Figure 3: Property Management System (P.M.S.) type in use

The criteria behind the preference of use of a particular P.M.S. in each hotel proves that 43% of them wants the software to offer users a variety of booking and pricing optimization options along with high-speed customizable services (36%). Moreover, there are hotels that request the system presents low maintenance cost and 24/7 customer service, although to a smaller decree (7-14%).

Despite of the fact that the G.D.P.R. has been set into effect recently, hotels appear to abide by a set of own rules to protect their guests' data (71%), even without the fear of potential severe consequences in the form of fines and loss of business credibility as a result of the G.D.P.R. On another subject, hotels are divided when inquired whether they process Big Data with a focus on some selected features of their guests; a 57% does not utilize this data while the rest 43% chooses to categorize this massive data as a step for better evaluation.

The following question (number 10) suggests that hotels are very reluctant (86%) to use their information, deriving from their Social Media platforms to fill-in any "gaps" in forming complete guest profiles with all characteristics and personal choices or actions. On the contrary, they believe that guests' reservation characteristics do have a role in determining the scope, procedure or objectives set by the management (86%). Furthermore, almost two thirds of them (71%) actually exploits all of guests' data to the benefit of forming a marketing strategy.

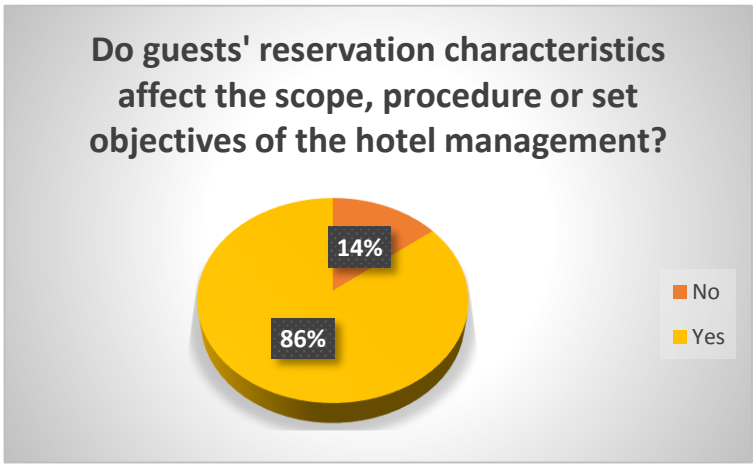

Figure 4: Guests' reservation characteristics' potential effect on hotel management's scope, procedure or set objectives

It is not unexpected that Big Data has an important value to hotels because a 71% of them is in need of it to highlight the way to better comprehend their guests' requirements. The reasons behind the choice of a hotelier to purchase a software for his/ her property are related to its contribution to the implementation of daily goals. Those are mainly rate parity across all sales channels (36%) and an even split percentage of 29% between increased direct booking and personalized guest service practices.

14. Which of the following two (2) goals does the daily use of your P.M.S. achieve?	
Increased direct bookings	29%
Low environmental impact	7%
Personalized guest service practices	29%
Rate parity across all sales channels	36%
Grand Total	100%

Table 2: Goals of hotel P.M.S.' daily use

Hotels do not share data with third party companies, such as taxi services. However, although they are divided to use this data to make decisions that refer to projects, such as property expansion, employee remuneration schemes etc., they are willing to partially showcase this information and rely on the results' findings to ascertain the undertaking of these projects. Hotels generally (86%) encourage guests' active participation in their new endeavors through posts, (re)tweets etc. on their Social Media profiles in an atmosphere that enhances and promotes the value of "co-creation" of experiences. A 100% of the answers also suggests that long-term benefits are acquired and – therefore – sought out by hoteliers.

Collecting Big Data is the first step in the procedure, followed by data analysis and concluded in the phase of assumption making. Otherwise known as evaluation, the results of the questionnaire point out a discrepancy in the unity of the time and the frequency hotels go through all this information. There is clearly an effort to keep up with a massive pile of data recovered from P.M.S. systems but there is a lack of Big Data specialists employed in the hotels.

Is there a specialist/ group of experts on Big Data employed in your hotel?

No	57%
Yes	43%
Grand Total	100%

Table 3: Employment of Big Data specialist/ group of experts in hotel

Afterwards, due to this lack of a specialist working for the hotel, the time intervals between each evaluation are reduced and therefore add more for manual work by non-experts on a uneven timeframe, like daily, weekly or annually (or at end of the summer season). A key factor in understanding how hotels in Greece operate surfaces from the fact that General Managers hold the power of knowledge generated by the Big Data of their guests (43%). Some hotels follow the path of entrusting this information to their e-commerce or marketing departments that handle external communication and promotional services to existing or potential guests.

The majority of hoteliers participating in this research claim that the lack of Big Data analysis software hinders their progress and forces them to work harder to evaluate this huge amount of data daily or weekly as a way to distribute their workload evenly between their assigned work duties and Big Data evaluation. Others have managed to

keep up with this task on a monthly basis because they opt for or are diverted to be more involved with other "key" operations that require their attention.

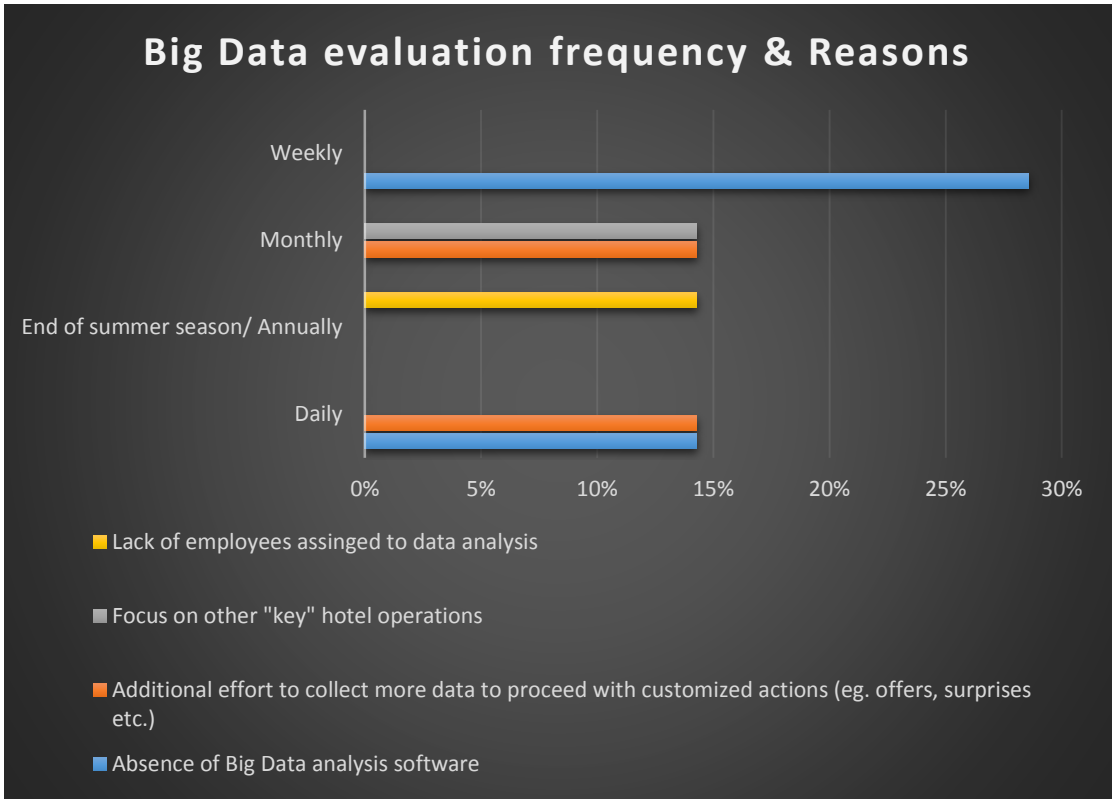

Figure 5: Big Data evaluation frequency and the reasons behind it

However, there also exists a small amount of hotels that do not have employees with a specialty in Big Data analysis to undertake this work and are subsequently unable to evaluate their guests' data until the end of summer season or each year.

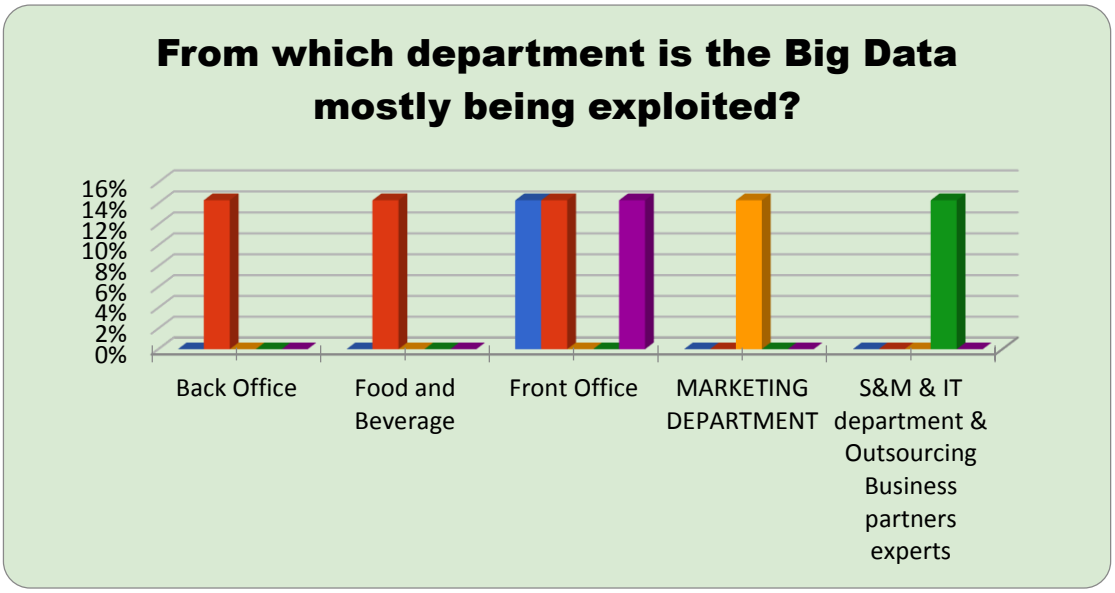

Figure 6: Relationship between most Big Data generating department and its exploiter

Regarding the relationship between the hotel management, which generates the majority of Big Data and the department from which it is mostly being exploited, there is a notably strong connection created amongst two departments. Those are the Front Office department and the hotel's top management respectively. The Front Office includes the Front Desk and all peripheral services, such as Concierge, Guest Service, Reservations, Porter Service and is distinguished from other crucial areas as one of the most important workstations, as it is the first and last to interact with guests.

A hotel's top management, on the other hand, may consist of the General Manager, the hotel owner, a Board of Directors or a Board of members belonging to a hotel management group or company. As they are the ones making the most significant and final decisions, it comes as no surprise that almost half of the hotels (43%) in the survey noted that they evaluate the Big Data of their hotel.

The survey's results also suggest that each of the rest departments is interested in the exploration of data closely associated with its functions and targets. For example, the Marketing Department emphasizes on marketing information whereas the Rooms Division one makes use of data shared with the Sales and Marketing and IT department to provide customized services during guests' stay. As expected, marketing not only guides but also rips the most benefits from Big Data, since it is the primary data needed to construct solid or adjustable effective strategies to increase sales, competitiveness and guest loyalty.

In addition, hotels revealed that they provide guests with special Guest Service attention (57%), as a form of restitution for sharing their personal information for their stay. On the contrary, a valid number of hotels admits that they do not offer anything in exchange for data (43%).

Hotel employees entrusted with the Big Data processing and evaluation, reveal that they are in need of little to some effort to extract the necessary and desired guest data from the sum of general information. Despite this, they think that the data process in effect yields significant results leading to a more or less successful hotel function. In terms of the effectiveness level of hotels' Big Data practices, they have generally (86%) responded positively. However, they still do not feel entirely confident, since they do not have the appropriate software and personnel to proceed with a professional, in-depth collection, analysis and results based on specific guest data.

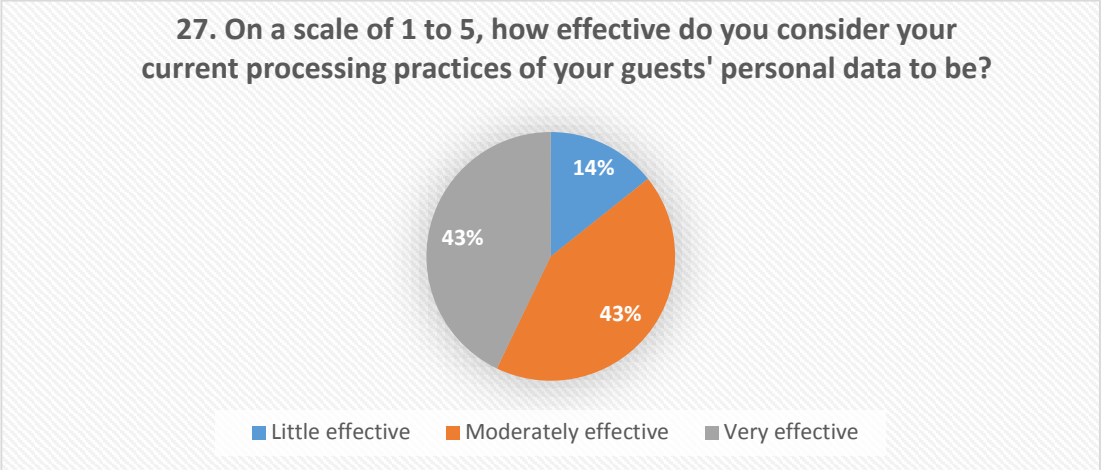

Figure 7: Effectiveness level of current guests' Big Data practices

However, what is evident is that no one of the survey participants is absolutely certain and confident that they exploit the total amount of data available even when they do not feel "exhausted" by the strenuous data collection process. All these deductions can be explained further, when there is an obvious "gap" in the whole

process, particularly in the case of experts and lack of customization options in the hotel software (or P.M.S.). When requested to rate (from 1 being the least to 3 the most) the amount of effort embedded in examining Big Data, they admittedly considered experts and personalized options in their hotel databases to restrict their job performance, as shown in the chart above.

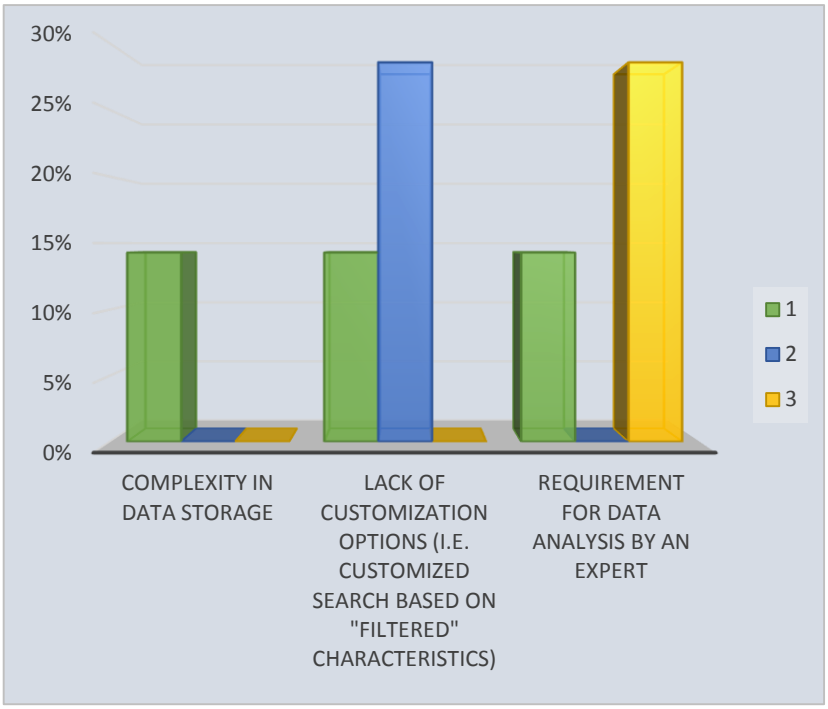

Figure 8: Efforts needed to extract specific data and the "gap" in current data analysis by the hotel's P.M.S.

The introduction of Artificial Intelligence in hotels has engraved a new road to follow. Despite this phenomenon, hotels do not show faith in A.I. in their P.M.S. systems (57%) as they consider it another means of intrusion into their guests' professional and personal lives. They also add complexity of procedures and potential high operational costs or even ignorance to the list of reasons behind their hesitation to adopt such advanced technologies into their daily operations' cycle.

30. Why is the case so?
CRM is the key and align data with business strategy
DO NOT KNOW
Less human power
entering too much into one's private or business life
economical reasons, complicated procedures
n/a
Would speed up data analysing and desicion making

Table 4: Participants' responses on the reasons for choosing (or not) a P.M.S. with Artificial Intelligence features

The positive and surprising answers discovered by the final question, signal a light of hope in the future of the industry in the prefectures of Halkidiki and the city of Thessaloniki. Hoteliers have made numerous suggestions regarding what they would like to experience in future marketing campaigns when it comes to Big Data integration; they wish to strengthen their CRM approach both to their business (B2B) partners as well as their clients (B2C), create a spirit of collaboration between Information Technology (IT) and other Back Office employees while exploring new markets and Social Media platforms to build successful and "extrovert" modern hotels.

31. What features would you suggest to be added to hotel P.M.S. systems to achieve more success in a future marketing strategy?
Business analysis outcomes, strategic experts as partners, business data analysts, directors of Information technology, B2C efforts from a team of reservations executive to repeat clientele, implement strong CRM strategy with direction to different segments and new markets.
I HAVE NO SUGGESTION
Personalised needs
to generate the possibility for the customer-facing teams to share their findings with back office teams
direct connectivity with OTAs & tour operators, online check in/out, connection with clients social media
n/a
Social networks accounts

Table 5: Suggestions for addition to hotel P.M.S. to achieve a more successful future marketing strategy

CHAPTER 6: Elaborating on findings

A hotel, which aims to be competitive and offer top quality services, needs to follow a standardized Big Data analysis procedure in a specified timeframe that accurately reflects guests' requests and characteristics. Non-automated and amateur attempts work against the hotel and its guests, stripping them of the joy of forming close and responsible relationships as well as competitive luxury services.

6.1 Discussion:

The hospitality industry are keeping the data on the site servers and just relying on the onsite servers is really time consuming and at the same time it is also vulnerable.

And if there is some problems in the server or if the servers goes out, it causes data loss and it enforces the employees to perform all the task manually. The situation gets even worse if the hackers get the server details and hack all the guest details which would include all the sensitive data and credit card information which will make the industry liable for all the leak and could cause a heavy loss to the industry.

It is almost next to impossible to handle the hotel's own data encryption and is referred by many as disaster waiting to happen. It is very difficult to be updated with malware threats and monitor all the malicious activities and stop hackers to crack the system. Meanwhile, cloud based data service can provide "military grade" security. The hospitality industries can focus on their bottom line while their data is being protected and processed and stored (Gupta, et al., 2017)[15].

On the issue of guests' data, according to the survey, there could be deducted that there is no systematic way of collecting, processing and evaluating it. This is a result of no focus on specific guests' characteristics like nationality, age, number of companions or time spent on fully exploiting all info provided by them to the benefit of the hotels. Naturally, hotels tend to more look for special reservation requests and characteristics that form their marketing strategies. However, as the majority of the responses received, finally proved, hotels still lack the ability to properly comprehend the deepest needs and desires of their guests.

They appear to be open and susceptible to change their practices if the P.M.S. systems become more reliable when handling sensitive data and when their partners can ensure confidentiality and trustworthy competitiveness and data usage, only for ventures associated with a particular hotel.

There are two conclusions to be reached from the correlation between the existence (or not) of a Big Data specialist in a hotel and the frequency, in which the Big Data is assessed. Firstly, the importance of the task itself requires that the process of evaluation takes place every week or month, as to make sure that the data remains relevant and represents the current status of hotel operations. This, in turn, provides hoteliers with the opportunity to take preventive action to confront problems as soon as

[15] Gupta, K., Gauba, T. & Jain, S., 2017. Big Data In Hospitality Industry: A survey. *International Research Journal of Engineering and Technology (IRJET)*, November, 4(11), pp. 477-478.

they are being generated, based on a specific and large "pool" of information that forms a clearer picture of guests' activities over a fair time period and not only on spontaneous or individual occurrences.

According to an industry report, the hotel companies, who can tackle big data and integrate into their business, are said to create a competitive advantage over others with a possible probability of 55% and above. Even after all the problems faced by the hospitality industry is not convinced to embrace big data because of the challenges involved in it (Gupta, et al., 2017)[16].

The employment of an expert would remove a load off hoteliers' "shoulders" and would form a standardized procedure concerning the analysis and in-house distribution of Big Data. All these questionnaire responses solidify the conclusion that the hiring of professionals, who have extensive knowledge of Big Data practices and automation of the whole process via a hotel software are incremental to a successful hotel operation. These practices are still very common amongst hoteliers and has been confirmed by a representative of a major hotel group, operating in these areas (Thessaloniki and Halkidiki) to be one of the main reasons why Big Data is often not fully exploited by hotels, in contradiction to global hotel chains.

[16] Gupta, K., Gauba, T. & Jain, S., 2017. Big Data In Hospitality Industry: A survey. *International Research Journal of Engineering and Technology (IRJET)*, November, 4(11), pp. 477-478.

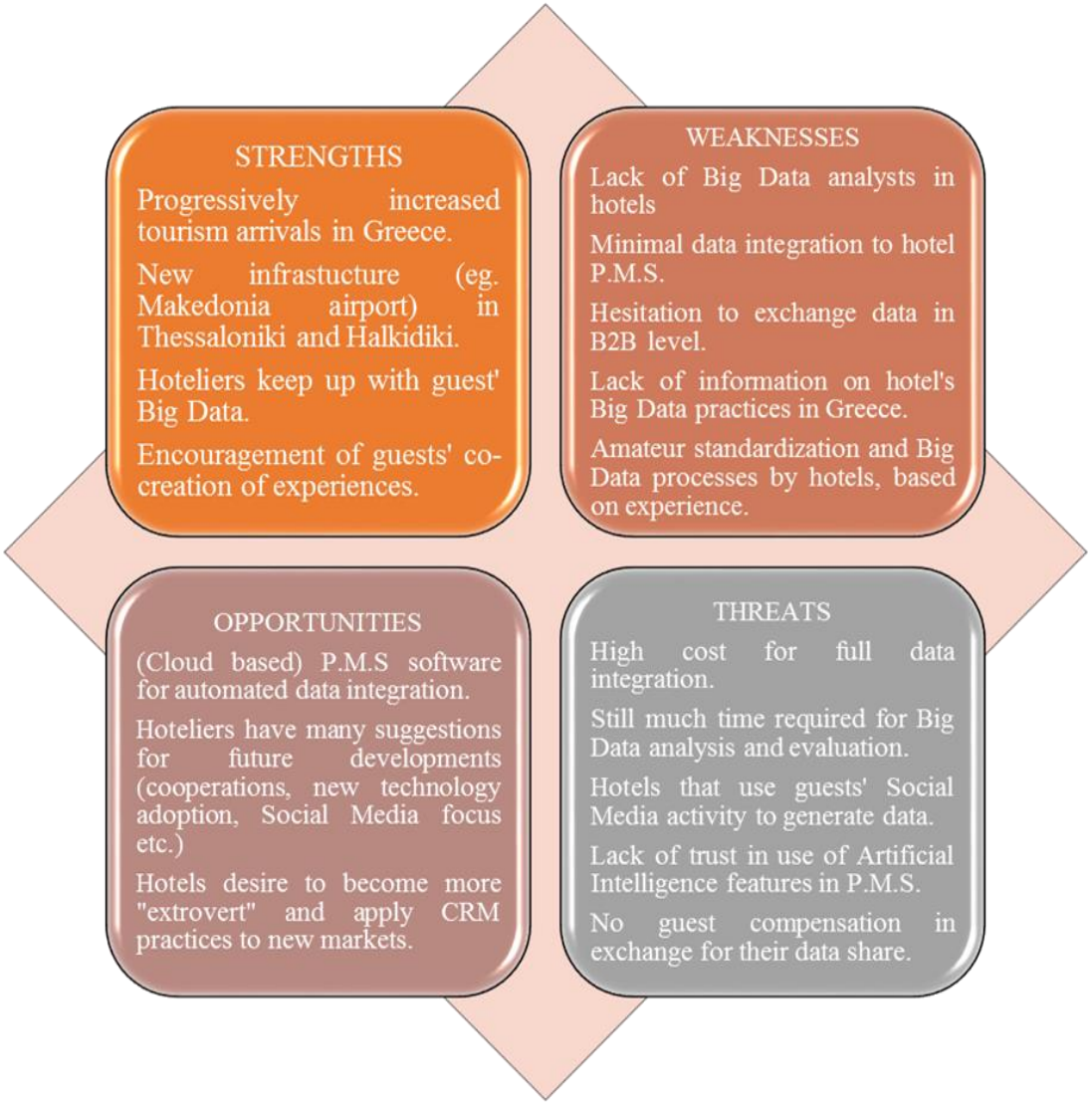

Figure 9: S.W.O.T analysis

The graph above summarizes and presents an overview of the survey's results in the form of an S.W.O.T. analysis model. It shows that there are numerous wrong practices still in existence when hotels process and/ or evaluate their guests' Big Data. Naturally, some of those courses of action yield positive results but there is a lot to be required in the future to increase their competitiveness and personal ambitions, particularly in comparison to successful industry rivals.

6.2 Recommendations:

Big Data is divided in two types. There is big and small data and it can be both structured and unstructured. The way in which this newly-acquired insight brings about

better decisions for a hotel is where analytics come in. The most complex and most recent type of analytics is prescriptive analytics. Prescriptive analytics combines structured and unstructured data with incredibly powerful computation, known in the data science world as "machine learning." This newly developed technology involves advanced algorhythmic processes that basically predict the future based on past performance (like predictive analytics). Yet prescriptive analytics goes further by factoring in big data like weather, traffic, or even geo-political events. It then offers possible actions based on this data (Bassford, 2016)[17].

It is not enough to own data, when it comes to the hotel industry. As Martin Soler, chief marketing officer at SnapShot, points out, being able to effectively aggregate, and then visualize and interact with data is key to bridging gaps between industry expertise and technical prowess. "Using data shouldn't require a PhD, it should be self-explanatory and the conclusions should come naturally," Soler writes. "It should tell you what it means with minimal effort. Good data should be presented in an aesthetic manner. It must be pleasing to the user and not add mental strain. Graphic design and layout are no longer a luxury, they are the norm." In other words, to address training, education, and data use in the hotel space, leadership can fuel adoption by addressing these factors as a design challenge as well.

When hotels lag in data analytics and the implementation of data-driven strategies, they often do so because of the costs associated with building out their data infrastructure. Automation is key to the IT solution for hotel data infrastructure. There are a lot of things that can be automated, or so many more opportunities where you don't have to rely on the human manual input of information," says Gogunova. "The problem is that the hospitality industry is often times very behind in terms of innovation and in understanding that it should be a more open environment (SnapShot + Skift, 2015)[18].

[17] Bassford, C., 2016. *SNAPSHOT.* [Online]
Available at: https://blog.snapshot.travel/the-hotel-data-cheat-sheet
[Accessed 13 January 2019].

[18] SnapShot + Skift, 2015. [Online]
Available at: http://skiftx.com/wp-content/uploads/2016/12/Skift-SnapShot-Hospitality-Analytics-1.pdf
[Accessed 13 January 2019].

One of the biggest opportunities under the analytics umbrella is artificial intelligence (AI), which carries important potential benefits for every sector of the travel and transportation industry. As rapid progress continues in AI-enabling technologies like machine learning, natural language processing, and video recognition, it is anticipated that artificial intelligence capabilities will soon reach the point where many travel companies are able to generate significant value by applying artificial intelligence at scale to their day-to-day operations.

In hospitality, companies are beginning to link predictive analytics with geolocation data to deliver effective recommendations on-property and in real time through mobile apps. For instance, one hotel company is piloting a program to drive ancillary revenues through the use of next-product-to-buy algorithms. On-property uses for analytics and artificial intelligence go beyond promotions and coupons. Over time, leaders in the sector could use geolocation data to deliver more sophisticated offers and services in all areas of the on-property experience and enable more efficient service operations.

Several companies across the hospitality value chain from intermediaries to global brands to individual properties are exploring opportunities to streamline service throughout the customer journey by introducing chatbots—messaging platforms powered by AI or AI-plus-humans. For example, metasearch site Hipmunk's Hello Hipmunk can identify upcoming travel plans and proactively suggest transport and lodging options for those dates.

As natural language processing technology continues to improve, chatbots will get better at conversing with users and handling all the steps in the travel journey from research to booking to stay. Chatbots with artificial intelligence capabilities should be able to learn a user's travel preferences based on past bookings, reviews, even social media activity, then use this data to extrapolate and make valuable suggestions on destinations, lodging options, restaurants, events, and anything else that might hold special appeal for the user.

In the near term, hospitality businesses are focused on how best to digitize the customer journey. In practice, that means reengineering steps such as the inefficient check-in and check-out experience, room-key access, or room-service ordering to make them immediately available via a smartphone. Several global hotel brands, however,

are already testing the ability of robots to perform check-in, concierge, and room-service tasks.

At the same time, advances in predictive analytics will drive improvements in forecasting. As demand forecasts become more accurate, pricing and yield strategies can become more sophisticated to capture greater value. As artificial intelligence increasingly powers these predictions, it should be expected to see a new wave of pricing and revenue-management strategies come into play. Major advances in natural language processing, facial recognition, video analytics, and machine learning will continue to open many new opportunities (Bhattacharjee, et al., 2017)[19].

CHAPTER 7: Epilogue

Travel and hospitality companies are only as good as the memories they can help guests create. For hotels of any kind, creating a positive experience is essential to success. With the competition often just across the street (or on the next webpage), hotels must provide superior service leading to an overall great experience. Customers expect companies to do more than just cater to their needs: they expect their needs to be anticipated. Hyper personalization is one way to unlock the way toward better, more tailored experiences. Lodging chains use data analytics to optimally price and manage their hotels and data analytics can open the ability to tune in to customer wants and of course, deliver on them.

Big Data analytics and the travel industry are natural partners. Travelers generate enormous amounts of data during their stays and at other times (booking, researching, reviewing social media). Hotel companies can use this data to personalize every possible experience and touchpoint. They can even make use of this flood of data to create operational changes that will impact their ideal customer.

The lifetime value of a customer is a much-talked-about subject for hotels, as over 30% of travelers visit the same hotel annually. Data analytics give hotels decision-making power about which customers to invest in. Big data can help determine just

[19] Bhattacharjee, D., Seeley, J. & Seitzman, N., 2017. *McKinsey&Company - Digital McKinsey.* [Online] Available at: https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/advanced-analytics-in-hospitality
[Accessed 13 January 2019].

what will convert a one-time customer to a repeat. And the answer is unique for each hotel. While big data is still in the adoption phase for the hotel industry, it's growing widely. Big data can help companies personalize promotional campaigns for their customers, price their rooms appropriately, and avoid losing money from either over- or under-booking their property (Pal & Yadav, 2017)[20].

In Greece, however, particularly in the areas of Thessaloniki and Halkidiki, hoteliers remain troubled by the massive amount of information they receive daily from their guests and make substantial efforts to become competitive and make the most out of all this data in their marketing campaigns. They often lack the appropriate tools and personnel to proceed with Big Data analysis and they encounter implications with their business associates. Despite all those issues, they are displaying a great will to embrace new strategic business partnerships, adopt CRM practices in their daily operations, make Social Media a focal point of interest and invest on human resources and new clientele.

This research took into account all information given by hotels in the aforementioned areas and showcased a theatre of hotel operations that is associated with Big Data. It uncovered that Greek hotels generally tend to follow global practices relating to the problems hotels encounter during the analysis of this specific kind of information and they lack experience, employees and software to understand their own data, confirming the initial hypotheses behind this research.

In a future term, it would be vital for hospitality businesses (and hotels in particular) to be further examined in another study or survey to determine how such actions by hoteliers have progressed and how they fare in comparison to competitors abroad. A wider population sample would also serve to provide even more accurate information and could potentially lead to a deeper examination of how new forms of technology and Artificial Intelligence create a new and constantly evolving meaning of

[20] Pal, T. & Yadav, S., 2017. *ABSOLUTDATA.* [Online]
Available at: https://www.absolutdata.com/blog/the-big-impact-of-big-data-on-hotels-and-their-guests/
[Accessed 13 January 2019].

hospitality services. The most important thing to remember, however, remains the same at all times; the data is there, hotels just need to put it to work (Pal & Yadav, 2017)[21].

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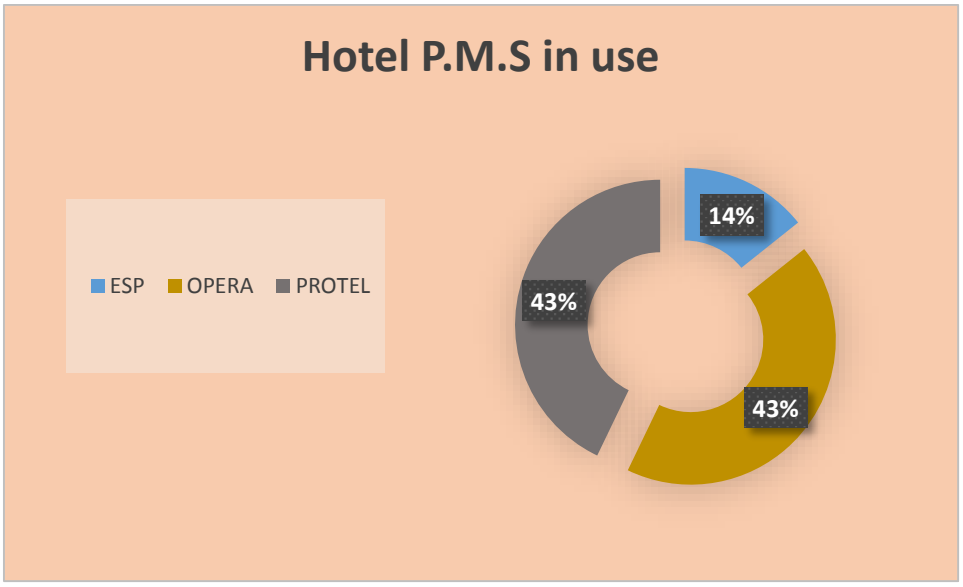
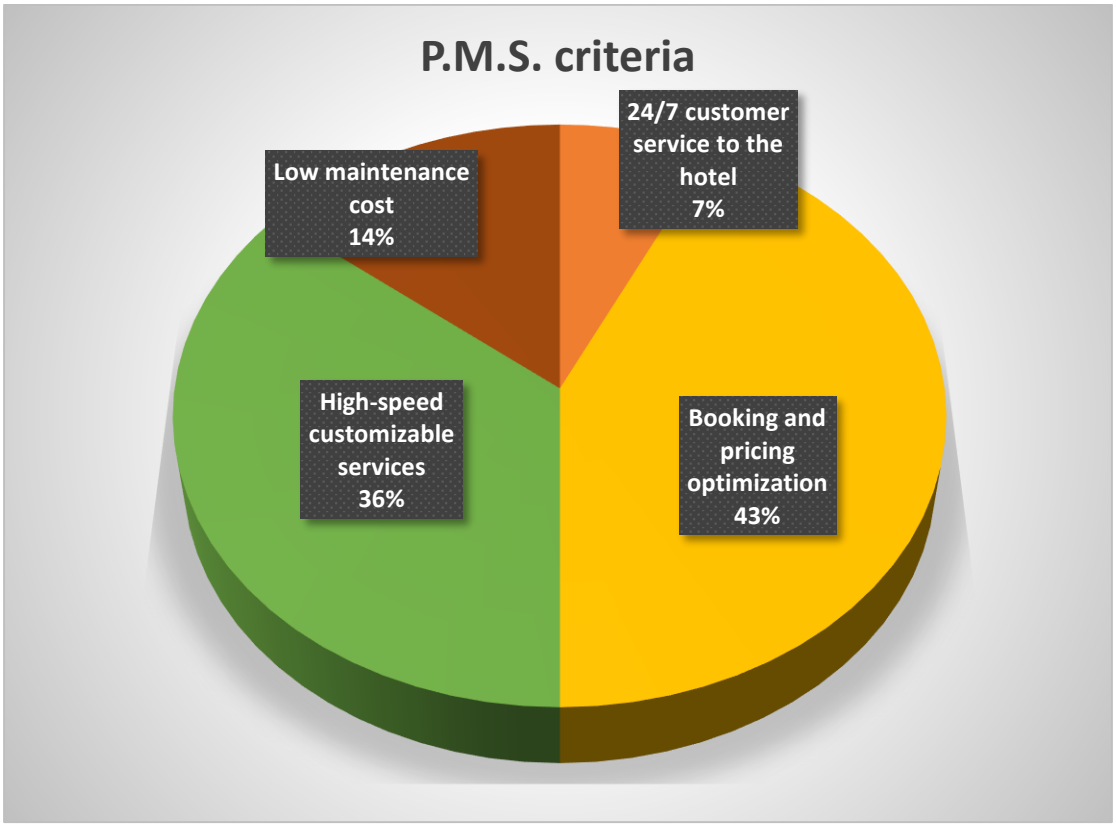
APPENDIX

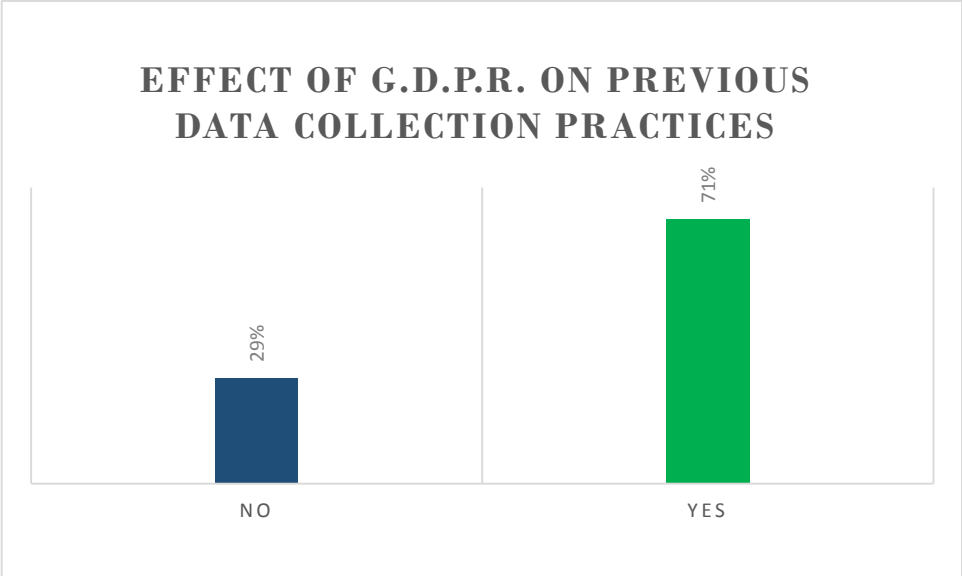
1. ADDITIONAL GRAPHS



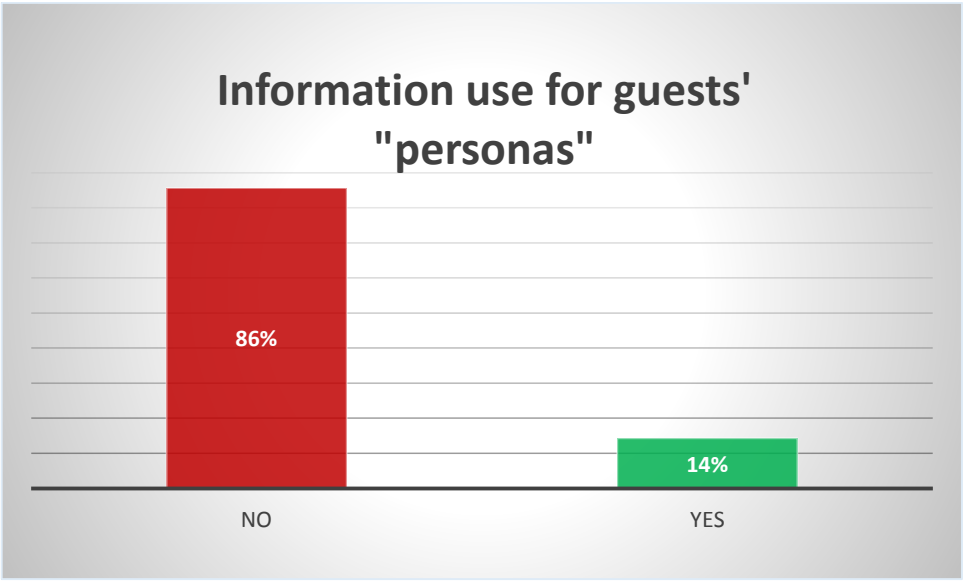
Question 5: Which Property Management System are you using in your hotel?



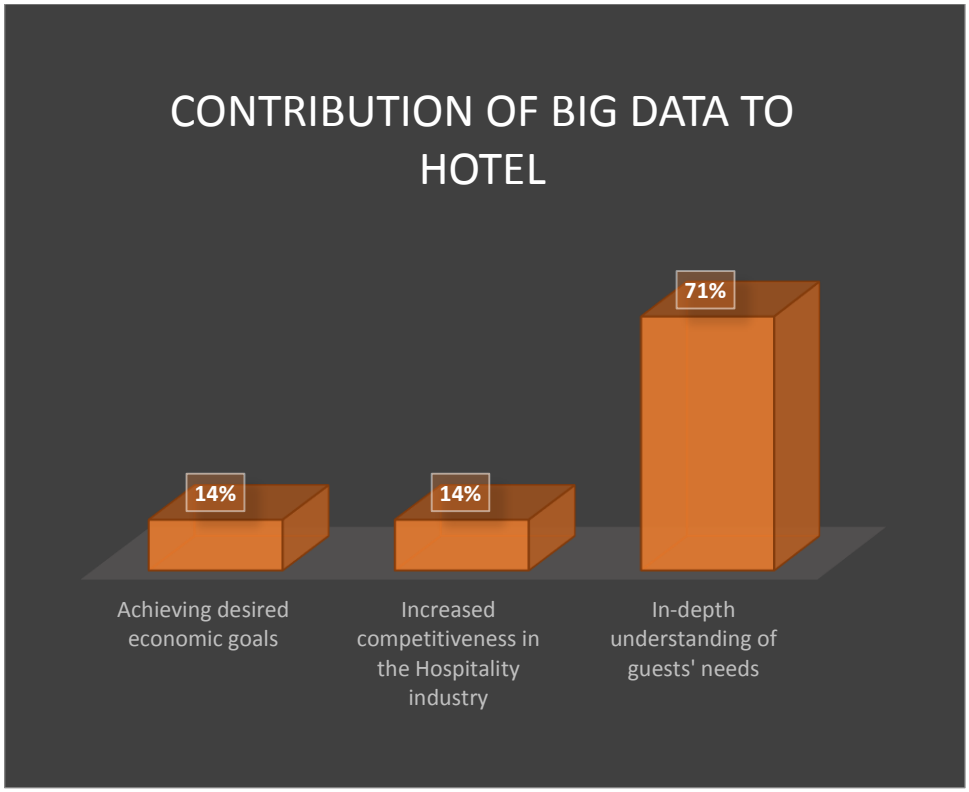
Question 7: Which two (2) primary criteria does this P.M.S. fulfill?



Question 8: Has the European Union's General Data Protection Regulation (G.D.P.R.) altered your previously implemented data collection practices?



Question 10: Do you use information from Social Media platforms to complete a guest's profile (or "persona")?



Question 13: What is the main contribution of processing Big Data to your hotel?

2. QUESTIONNAIRE ANSWERS (questions 2 – 29)

2. What is your position in the hotel?	**3. On what sort of Big Data do you mostly focus?**
General Manager	Guest-generated data (eg.personal information, "co-created" experiences)
HR MANAGER	Guest-generated data (eg.personal information, "co-created" experiences)
General Manager	Guest-generated data (eg.personal information, "co-created" experiences)
Reception and Invoice Control	Third-party data (eg. suppliers, partner companies)
Rooms Division Manager	Third-party data (eg. suppliers, partner companies)
Banquet Sales Executive	Guest-generated data (eg.personal information, "co-created" experiences)
Sales Manager	Guest-generated data (eg.personal information, "co-created" experiences)

4. What is the preferred method of Big Data collection in your hotel?	5. Which Property Management System are you using in your hotel?
Hotel Property Management System (P.M.S.)	OPERA
Hotel Property Management System (P.M.S.)	PROTEL
Hotel Property Management System (P.M.S.)	OPERA
Questionnaires (online, printed)	PROTEL
Hotel Property Management System (P.M.S.)	PROTEL
Hotel Property Management System (P.M.S.)	OPERA
Hotel Property Management System (P.M.S.)	ESP

6. What type of P.M.S. is it	7. Which two (2) primary criteria does this P.M.S. fulfill?
SaaS (Software as a Service), a cloud-based software	High-speed customizable services, Booking and pricing optimization
SaaS (Software as a Service), a cloud-based software	High-speed customizable services, Booking and pricing optimization
Traditional software	High-speed customizable services, Low maintenance cost
Traditional software	High-speed customizable services, Booking and pricing optimization
Traditional software	Booking and pricing optimization, 24/7 customer service to the hotel
SaaS (Software as a Service), a cloud-based software	High-speed customizable services, Booking and pricing optimization
Traditional software	Low maintenance cost, Booking and pricing optimization

8. Has the European Union's General Data Protection Regulation (G.D.P.R.) altered your previously implemented data collection practices?	9. During the examination of Big Data, do you focus on particular groups of guests based on specific personal characteristics (i.e. country of origin, family/ party members, profession or interests etc.)
Yes	Yes
Yes	Yes
Yes	Yes
Yes	No
Yes	No
No	No
No	No

10. Do you use information from Social Media platforms to complete a guest's profile (or "persona")?	11. Do guests' reservation characteristics (eg. last-minute or direct reservations) affect the scope, procedure or set objectives of the hotel management?
No	Yes
No	Yes
No	Yes
Yes	Yes
No	Yes
No	No
No	Yes

12. Do you integrate all guests' information from the P.M.S. into your hotel's marketing strategy?	13. What is the main contribution of processing Big Data to your hotel?
No	In-depth understanding of guests' needs
Yes	Increased competitiveness in the Hospitality industry
Yes	In-depth understanding of guests' needs
Yes	In-depth understanding of guests' needs
No	Achieving desired economic goals
Yes	In-depth understanding of guests' needs
Yes	In-depth understanding of guests' needs

14. Which of the following two (2) goals does the daily use of your P.M.S. achieve?	15. Do you share Big Data with your hotel's partners (eg. Tour Operators, partner taxi/ shuttle company etc.)?
Increased direct bookings, Personalized guest service practices	No
Increased direct bookings, Rate parity across all sales channels	No
Rate parity across all sales channels, Personalized guest service practices	No
Low environmental impact, Personalized guest service practices	No
Increased direct bookings, Rate parity across all sales channels	No
Increased direct bookings, Rate parity across all sales channels	No
Rate parity across all sales channels, Personalized guest service practices	No

16. Do you encourage your guests' active participation in creating new content (eg. online reviews, posts on Social Media) to further promote your hotel?	17. Does your hotel's Big Data have a use in B2B meetings or other business ventures (eg. expansion plans, change in employees' remuneration schemes, renovation or "takeover" efforts etc.)?
No	No
Yes	Yes
Yes	Yes
Yes	Yes
Yes	No
Yes	No
Yes	Yes

18. Do you use guests data to acquire long-term benefits (like guest retention)?	19. How often is Big Data being evaluated by the hotel management and staff?
Yes	Monthly
Yes	Monthly
Yes	Daily
Yes	Weekly
Yes	Weekly
Yes	End of summer season/ Annually
Yes	Daily

20. Why is this amount of time required in order to evaluate Big Data?	21. Is there a specialist/ group of experts on Big Data employed in your hotel?
Additional effort to collect more data to proceed with customized actions (eg. offers, surprises etc.)	Yes
Focus on other "key" hotel operations	Yes
Additional effort to collect more data to proceed with customized actions (eg. offers, surprises etc.)	Yes
Absence of Big Data analysis software	No
Absence of Big Data analysis software	No
Lack of employees assinged to data analysis	No
Absence of Big Data analysis software	No

22. Who is responsible for the evaluation of your hotel’s Big Data?	23. Which department generates the majority of your hotel's Big Data?
CIT Director & CSMO Director & Data Analysists	S&M & IT department & Outsourcing Business partners experts
MARKETING DEPARTMENT	MARKETING DEPARTMENT

Director of e commerce	Front Office
General Manager	Food and Beverage
Rooms Division Manager	Front Office
General Manager	Back Office
General Manager	Front Office

24. From which department is the Big Data mostly being exploited?	**25. What kind of compensation do your guests receive in exchange for sharing their personal information?**
Rooms Division	Guest Service attention
MARKETING DEPARTMENT	Nothing
Sales and marketing	Nothing
Hotel Top Management	Guest Service attention
Front Office	Nothing
Hotel Top Management	Nothing
Hotel Top Management	Guest Service attention

26. How much effort is needed to extract the required data from the general "pool" of data?	**27. On a scale of 1 to 5, how effective do you consider your current processing practices of your guests' personal data to be?**
3	4
1	4
1	3
2	3
1	3
3	2
2	4

28. What type of "gap" do you find in the current data analysis by the P.M.S. systems?	**29. Would you opt for a P.M.S. that features Artificial Intelligence (A.I.) characteristics (eg. reputation management, competitive intelligence etc.)?**
Requirement for data analysis by an expert	Yes
Complexity in data storage	No
Requirement for data analysis by an expert	Yes
Lack of customization options (i.e. customized search based on "filtered" characteristics)	No
Lack of customization options (i.e. customized search based on "filtered" characteristics)	No
Requirement for data analysis by an expert	No
Lack of customization options (i.e. customized search based on "filtered" characteristics)	Yes